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NUTRITION REVIEWS

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ERRATUM

Vol. 9, No. 10, page 289, column 2, 1st paragraph, line 24; and page 291, column 2, 1st paragraph, line 2:
anticoagulation *should read* antihemorrhagic

NUTRITION REVIEWS

VOL. 9 DECEMBER 1951 No. 12

AN ACTION PROGRAM FOR BETTER NATIONAL NUTRITION

By far the principal market for the products of agriculture is the human stomach. What people eat and what they will eat in the future are thus matters of vital concern both to farmers and the food industry. The nutrition discoveries of recent years have had a large influence on the kind and amounts of food eaten. These findings will have an increasing influence in the future as their significance becomes more widely understood. Furthermore, it can be confidently predicted that current nutritional research will result in additional discoveries of large importance. Clearly, agriculture should be vitally interested in the nutritional facts which will increasingly determine what people eat and, in turn, the market for its products.

It may surprise some to learn that despite our abundant food supplies and our generally high purchasing power, a substantial proportion of our population is not getting the kind of diet it should have. It is true that the average per capita food and nutrient supplies available have been more than adequate to meet average per capita needs. We have been well-fed on the average, but this has been far from true for many families and individuals. We have been too content with the average picture. The continuing existence of underfed groups and individuals throughout our population clearly calls for a stepped-up action program for better national nutrition. In terms of the well-being of the nation, the physical and mental ill-health caused by malnutrition is a matter of real concern. This is particularly true in an emergency which calls for an all-out national effort. Underfed bodies can't be really productive. An effective program must be focussed on the causes of malnutrition in those groups and individuals where it exists. The causes are multiple and interrelated.

Repeatedly it has been shown that malnutrition is most serious among the low-income groups. Income is by no means the sole factor involved, but it must be recognized that there are many who just don't have enough money to buy an adequate diet. These people present a difficult problem. They would be helped by a cheaper food supply which would result from economies in production and marketing and by the development of new low-cost, acceptable and nutritious products. When food prices rise, more attention should be given to finding practicable ways of providing increased public assistance to low-income groups which otherwise cannot have an adequate diet. The prevention of ill-health and decreased work capacity through better nutrition is as justifiable a use of public funds as the care of the sick, and more economical in the long run.

While low income is clearly one cause of malnutrition, adequate purchasing power is no guarantee of a good diet. This fact is shown by reports issued by the Bureau of Human Nutrition and Home Economics on the nutritive content of city diets. In the case of the diets of families with annual incomes from $5000 to $7000, 36 per cent of them did not meet the recommended dietary allowance for calcium, 19 per cent were short of thiamine, and 10 per cent weren't getting the full allowances of at least one of five other nutrients. One can spend a lot for food and not get an adequate diet.

At all income levels a lack of appreciation of the vital role of a good diet in the health and vigor of the individual and the nation, and a lack of knowledge as to how to select such a diet continue to be important causes of malnutrition. Much of the malnutrition now ascribed to low income could be greatly helped if the people concerned had a better understanding of the high place which a

good diet deserves in their budgets in terms of their health, and if they knew how to use their money to better advantage in selecting the foods needed. Much has been accomplished by nutrition education, but much more needs to be done.

There is an especial need for an expanded nutrition program to reach city people. The agricultural extension service has done a remarkable job in covering rural areas, but comparatively few urban people, the groups which make up by far the larger majority of our population, are effectively reached. There is clear evidence that they both need and want sound nutrition education. Such a program should give special attention to helping the homemaker make the best of her food dollar in terms of the kinds of products available at different seasons. The program can be of special service by encouraging the more prompt and efficient movement of farm products to the consumer and by reducing the waste which arises from poor handling of food and from market gluts.

An over-all program of nutrition education must do more than teach the individual good eating habits. It should also develop a public consciousness of the importance of good nutrition and of sound food policies for the promotion of our national vigor and stability. Ill-fed people do not make good citizens. Employers need a greater appreciation of how good nutrition increases work efficiency and cuts down absenteeism. Taxpayers need to realize that good nutrition decreases public expenditures for medical care and for the support of those unable to earn their own living.

The promotion of a better understanding between agriculture and consumers that they have food problems of mutual concern would serve the interests of both, and the national economy as well. In the United States consumers have never known what it means to be really short of food. They need more understanding of the contributions of agriculture in insuring their food supply and more knowledge of the farm problems involved. On the other hand, agriculture is dependent on consumers for its market. It needs to improve its public relations with consumers. Agriculture could do this by taking a more active interest in their problems and in helping them to get the kinds of foods they like and need for better health and vigor. Different segments of agriculture and the food industry should do more to promote the importance of a good diet in general, not merely of the specific foods they may be interested to sell. They should foster the idea among those concerned outside of the fields of agriculture and food that "good nutrition is good business."

The cause of nutrition will be best served if care is taken to keep our educational and promotional programs sound in terms of established facts. Vitamin discoveries represent an important contribution of nutrition research of recent years, but there are many other essentials for an adequate diet. Overenthusiastic advertising and popular articles have led some to believe that a vitamin pill a day makes food selection a matter of minor importance. Others, who recognize the statements made as being extravagant, have been led to put less reliance in the actual facts of nutrition. Similarly, there have been exaggerated claims made for agricultural products, which hurt rather than help the cause of nutrition in the long run.

Damaging statements of a different sort have come from misguided enthusiasts and even from some in responsible positions in agriculture and in industry, who are promoting the thesis that poor soils are responsible for a decrease in the nutritive value of specific food crops and animal products, and thus result in serious malnutrition. These ideas continue to be set forth without adequate evidence for them and, in fact, in spite of specific evidence to the contrary. These enthusiasts are doing both agriculture and the cause of nutrition harm by undermining public confidence in the nutritive value of agricultural products. A statement such as the one that children will not have

good bones if fed milk from cows on a poor soil makes the headlines. The scientist can cite indisputable evidence why the statement is false, but his pronouncement has comparatively little news appeal. The mother remains worried about the nutritive value of the milk she is giving her child. Many others become unjustifiably skeptical about the product. The extent to which such scientifically unsound statements and speculations are believed by intelligent people not familiar with the facts is both amazing and serious. Food producers should join with nutrition scientists in putting the facts before the public and in trying to restrain those who are doing both agriculture and nutrition a disservice.

The improvement of the soil has been and will continue to be of tremendous importance in human nutrition and health by providing the higher yields of food required for a growing population. The increased supplies of animal products, fruits and vegetables thus provided represent a contribution of special significance. Clearly it is in these respects, primarily, that soil fertility is important to human welfare, rather than through any influence on the nutritional quality of a specific food crop or animal product. The latter, however, represents an area deserving of further research, particularly sound long-term investigations as distinguished from the superficial observations on which claims as to direct relationships are now being based.

A further cause of the sporadic existence of malnutrition which calls for an active program is the lack of availability, locally or seasonally, of enough of the kinds of foods especially needed and wanted and at reasonable prices. The selection of an adequate diet becomes less likely accordingly. Many different food patterns exist and people will not be well-fed unless they like the food available, no matter how nutritious it may be. Much more can be done both by agriculture and the food industry to provide the various groups and individuals of the population with the needed nutrients in terms of the kinds of foods they prefer. Getting food supplies to all consumers regularly in a wholesome and acceptable condition, with their nutritive values unimpaired, means both a better market for food and better national health.

An active program for better nutrition calls for an intensified program of research. The nutrition discoveries of the past fifty years and particularly of the last twenty have made outstanding contributions to health and to agriculture as well. There is no indication that we are approaching the end of these discoveries. The search for unknown nutrients which may be required in an inadequate diet must be actively continued. At the same time, modern food developments call for intensified research to make sure that our foods as produced, processed, and marketed contain nothing which is harmful to nutrition and health. Clearly, both agriculture and the food industry should support such research in the public interest as well as for its own protection. The cause of nutrition is best served by getting all the facts as rapidly as possible whenever there is any basis for question. A case in point is the idea that certain animal products may promote the onset and severity of arteriosclerosis after middle life. Limited research to date shows that this possibility exists. On the basis of inadequate evidence, people are being advised by some physicians, and particularly by popular writers, to avoid or cut down on the use of eggs, butter, milk and organ meats. Arteriosclerosis is a serious degenerative disease. On the other hand, the animal products in question are of vital importance for an optimum diet. Agriculture has as large a stake as the general public in getting the actual facts as rapidly as possible.

Our nutrition programs would be more effective if we had more knowledge as to "why people eat what they eat." What is the basis of food habits and how can they be modified in the interest of better nutri-

tion? Fundamental sociologic as well as nutritional studies are here called for. The information gained should be immediately useful in marketing programs and in guiding nutrition education, both currently and in the long run.

The foregoing references to needed research are merely examples. Investigators are conscious of a multitude of problems, the solution of which would greatly advance the cause of nutrition. They are also aware that basic research, without any evident practical goal, is just as important as studies having a more immediate objective. Without an active program of both basic and applied research the state of national nutrition would decline rather than advance.

In any emergency situation which may arise, we shall require a very active nutrition program geared to meet immediate needs. This should not cause us to lose sight of the long-time importance of a broad and expanding program along the lines I have indicated. There are new horizons in nutrition not now visualized by many. There is a potential for health, for better living and for social and political development which can be realized through nutrition education and research.

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PORTAL BLOOD INVESTIGATIONS IN MAN

Studies of intermediary metabolism and absorption of nutrients in patients with liver disease have been hampered by the unavailability of portal vein blood. Recently the anastomotic veins coursing over the anterior abdominal wall have been used as a source of portal blood. These channels, which often become large and numerous in patients with liver disease, presumably arise because of the high portal venous pressure and obstruction to normal blood flow through the liver. The blood in these veins usually empties into the superior vena cava, although occasionally branches of the inferior vena cava may receive a large proportion of this collateral blood. Since the blood comes from, and the flow is away from the portal vein, it usually has been considered that the blood in these collateral channels is representative of portal vein blood; that is, blood having passed through the capillaries in the gastrointestinal tract and moving toward the liver, but shunted around the liver because of obstruction to the blood flow there. It is possible, of course, that systemic venous channels may contaminate the portal blood in these collaterals. Also casting some doubt on the pure portal origin of the collateral vein blood is the possibility that the hepatic artery blood may enter the portal circulation via shunts in the diseased liver substance.

S. H. Blondheim and H. G. Kunkel (*Proc. Soc. Exp. Biol. Med.* **73,** *38 (1950)*) demonstrated higher levels of para-aminobenzoic acid, sulphadiazine, sodium thiocyanate, and sodium fluorescein in the collateral blood than in the blood from an anticubital vein shortly after the oral administration of each of these substances. This was thought to prove that the blood in these collaterals came more directly from the gastrointestinal tract than that in the peripheral veins, and presumably was portal in origin.

S. Sherlock and V. Walshe (*Clin. Sci.* **6,** *113 (1946)*) completed several interesting studies of absorption by analysis of the blood of a large anastomotic vein in a patient with cirrhosis of the liver. When 40 g. of galactose were given orally the abdominal vein blood contained 20 mg. per cent, one hour after the sugar administration, while that of the arm vein was only 7 mg. per cent. Blood glucose concentration was the same in both veins during fasting. When glucose and levulose were given by mouth

the concentration in the abdominal wall vein rose before that in the anticubital vein.

Seventy-five g. of dairy butter mixed with barium sulphate were given to this patient through a tube into the duodenum on two separate occasions. No rise in blood lipid phosphorus, cholesterol, total fatty acids, or neutral fat occurred in either the collateral or the anticubital vein during the two hours of study. However, when a lipase preparation was added to the fatty meal there was a slight increase in blood fatty acid and neutral fat concentration but no change in phospholipid or cholesterol. Glucose absorption studies of the abdominal collateral vein also have been conducted by F. T. Billings and H. E. DePree (*Bull. Johns Hopkins Hosp.* **85,** *183 (1949)*).

J. D. Myers (*J. Clin. Invest.* **29,** *836 (1950)*) studied the absorption of sodium sulfathiazole and of glucose by first placing a catheter in the hepatic vein to collect blood for analysis. He then compared the concentration of these substances in the hepatic, portal venous collateral, and arterial blood. He concluded that in the 3 patients with cirrhosis studied there was a wide difference in the contribution by the hepatic artery and by the portal vein.

Further studies using these collateral veins have been done by W. B. Bean, M. Franklin, J. F. Embick, and K. Daum (*J. Clin. Invest.* **30,** *263 (1951)*). These observers studied 2 patients with cirrhosis of the liver and with large collateral venous channels on the abdomen readily available for puncture. The absorption studies were done on the day following paracentesis and after a period of one week during which the patients were provided with a high carbohydrate, high protein and unrestricted fat diet with additional vitamins and brewers' yeast. A test meal was administered to these 2 patients consisting of 60 g. of protein in the form of skimmed milk and skimmed milk powder, 80 g. of fat as cream, 50 g. of glucose, 50 g. of fructose, 500 mg. of ascorbic acid, 5. mg of thiamine, and 10,000 to 25,000 units of vitamin A in 250 ml. of water. As in the previous studies reported, following the administration of glucose there was a higher portal than systemic blood glucose concentration. The same was true of blood fructose concentration following the administration of fructose by mouth. Blood thiamine and vitamin A were likewise higher in the portal than in the systemic blood, whereas with respect to vitamin C both rose almost identically after the test meal. In three instances in which neutral fat was studied there was a distinctly higher systemic than portal fasting neutral fat concentration. The changes following the test meal were, as the authors state, quite irregular, but appeared to rise more rapidly in the portal than in the systemic blood. Surprisingly enough, the 60 g. of protein produced almost no difference between the portal and systemic systems, in fact, in two of the three instances there was little rise in blood amino acid concentration in blood samples from either of the two sites.

These studies of absorption and intermediary metabolism using the portal anastomotic venous collaterals on the anterior abdominal wall suggest new methods for the study of intermediary metabolism in man, especially in diseases of the liver. When this technic is combined with that of venous catheterization to obtain hepatic vein blood, opportunities are presented for greatly increasing our knowledge of these subjects.

VITAMIN DEFICIENCIES IN YOUNG RUMINANTS

With the development of synthetic milk diets (A. C. Wiese, B. C. Johnson, H. H. Mitchell, and W. B. Nevens, *J. Dairy Sci.* **30,** *87 (1947)*) it has been possible to study the individual vitamin deficiencies of young ruminants. Such diets suppress the develop-

ment of normal rumen function and thus limit the synthesis of vitamins by microorganisms in the rumen.

Under such dietary conditions it was demonstrated that young calves became paralyzed in the hindquarters when biotin was omitted from the diet; this paralysis was curable by biotin administration (A. C. Wiese, B. C. Johnson, and W. B. Nevens, *Proc. Soc. Exp. Biol. Med.* **63,** *521 (1946)*). Pantothenic acid deficiency in young calves results in diarrhea, cessation of growth, weakness in the legs and inability to stand (Johnson, H. H. Mitchell, T. S. Hamilton, and Nevens, *Fed. Proc.* **6,** *410 (1947)*). Calves grew well and remained healthy in the absence of dietary niacin (*Nutrition Reviews* **5,** *256 (1947)*), presumably because of the synthesis of this vitamin from tryptophan, since the diet employed contained 30 per cent of casein.

Riboflavin deficiency in calves was characterized by hyperemia of the buccal mucosa, loss of appetite, excessive lachrymation and loss of hair (A. C. Wiese, B. C. Johnson, H. H. Mitchell, and W. B. Nevens, *J. Nutrition* **33,** *263 (1947)*). Calves suffering from thiamine deficiency exhibited weakness, incoordination of the legs, convulsions, and in some cases dehydration (Johnson, T. S. Hamilton, Nevens, and L. E. Boley, *Ibid.* **35,** *137 (1948)*). Pyridoxine deficiency in young calves resulted in loss of appetite, poor hair coat, and in some cases epileptiform fits (Johnson, J. A. Pinkos, and K. A. Burke, *Ibid.* **40,** *309 (1950)*). Lambs reared on a riboflavin-deficient diet lost their appetite, made poor weight gains and developed pneumonia. These symptoms were rapidly alleviated by riboflavin administration (R. W. Luecke *et al.*, *J. Animal Sci.* **9,** *420 (1950)*).

Considerable data have thus been accumulated to demonstrate the importance of the B vitamins in the nutrition of young ruminants. A recent paper by H. H. Draper and B. C. Johnson (*J. Nutrition* **43,** *413 (1951)*) from the University of Illinois is a further study of this type in which it is emphasized that young lambs require a dietary source of thiamine.

The synthetic milk diet used consisted of vitamin-free casein 30, lard 30, mineral mixture 6, and cerelose 34 per cent. This mixture was diluted with water to 13 per cent solids and supplemented with the following vitamins, in milligrams per liter: Thiamine, 0.65; riboflavin, 1.30; calcium pantothenate, 1.95; niacin, 2.60; pyridoxine, 0.65; inositol, 26.0; choline, 260.0; folacin, 0.26; biotin, 0.02; alpha-tocopherol, 1.0; and 2-methyl-1,4-naphthoquinone, 0.26. Vitamins A and D were added at levels of 2,000 and 200 I.U. per liter respectively. Each lamb was given an additional supplement of 10,000 and 2,000 I.U. of vitamins A and D at the start of the experiment. Sulphathalidine was added to the milk diet at a level of 3 g. per liter.

Six crossbred lambs, one to three days old, were used for the study. All had received colostrum before being placed on experiment. Thiamine was deleted from the diet of 4 of the lambs; the other 2 served as thiamine-adequate controls.

The lambs receiving thiamine grew at rates of 0.35 and 0.43 pounds per day and at the end of the experimental period of six weeks were in apparent good health. Symptoms of thiamine deficiency developed in the 4 lambs on the deficient diet. Anorexia and cessation of growth occurred after two to three weeks, and convulsive seizures were noted in four to five weeks. A heart rate of 50 to 60 per minute in the quiescent periods between convulsive seizures indicated that one of the symptoms of thiamine deficiency in the lamb is bradycardia. Heart enlargement, however, was not observed in the deficient lambs.

A 10 mg. dose of thiamine, given intramuscularly, relieved convulsive symptoms in the deficient lambs and restored appetite within a few hours. The intravenous administration of 20 ml. of 5 per cent glucose solution aggravated the convulsive symp-

toms of thiamine deficiency and resulted in death within a few minutes.

Since it has been suggested, in studies with rats and mice, that massive doses of sodium pyruvate produce acute muscular symptoms similar to those observed in thiamine deficiency, the Illinois investigators administered pyruvate. One thiamine-deficient lamb was cured with a 25 mg. dose of thiamine, and then again placed on the deficient diet for fifteen days; at this time 1 g. of sodium pyruvate was administered intravenously. An immediate but transitory reaction was obtained that resembled thiamine deficiency convulsions. Similar responses to pyruvate were obtained on the seventeenth and twenty-second days in the same lamb. On the thirtieth day the lamb developed severe convulsive symptoms that failed to respond to fumarate administration. Fifty mg. of thiamine brought about a prompt recovery.

Urinary thiamine excretion studies were also conducted. The 4 deficient animals were excreting 18 to 41 micrograms of thiamine per twenty-four-hour period initially and by the end of the third week of the experiment this had decreased to 1 to 7 micrograms per twenty-four-hour excretion. The thiamine-adequate control lambs maintained excretory levels of between 15 and 43 micrograms per twenty-four hours during the five-week period of the study.

Data on pyruvic acid excretion indicated that a sharp increase in urinary concentration occurred immediately prior to the development of convulsive symptoms of thiamine deficiency. For example, one of the thiamine deficient lambs excreted a urine containing 3.8 mg. per cent of pyruvic acid on the day before convulsive seizures occurred. The urine of the thiamine-adequate controls contained 1.1 mg. per cent of pyruvic acid.

These results thus establish that thiamine is an essential nutrient for the young lamb, and add to the accumulating evidence that young ruminants are susceptible to deficiencies of vitamins of the B complex.

ANTIBIOTICS FOR TURKEY GROWTH

E. L. R. Stokstad and co-workers (*J. Biol. Chem.* **180,** *647 (1949)*) have observed that a fermentation product of *Streptomyces aureofaciens* promoted growth in chicks. This growth response was later shown to be due to aureomycin in the culture (Stokstad and T. H. Jukes, *Proc. Soc. Exp. Biol. Med.* **73,** *523 (1950)*). As a result of these observations there has been a great deal of interest in the nutritional significance of the various antibiotics (*Nutrition Reviews* **8,** *298 (1950)*).

Recently J. McGinnis, J. R. Stern, R. A. Wilcox, and J. S. Carver (*Poultry Sci.* **30,** *492 (1951)*) have determined the comparative effects of different antibiotics on the growth of turkey poults. In the first experiment the poults were from eggs that had been produced by hens on a diet low in vitamin B_{12}. The diet fed to the poults was composed of the following in per cent: corn, 26.5; wheat, 10.0; alfalfa, 1.0; soybean meal, 57.0; dicalcium phosphate, 2.0; limestone, 3.0; salt, 0.5; manganese sulphate, 0.08; and vitamins A and D supplement (5000 I.U. of A, 1000 I.U. of D per gram), 0.2. This was fortified with the following in milligrams per 100 g.: riboflavin, 0.2; niacin, 3.0; calcium pantothenate, 0.5; choline chloride, 100.0; thiamine, 0.3; pyridoxine, 0.5; and folacin, 0.1.

This diet was supplemented with 10, 20, or 30 micrograms of vitamin B_{12} per kilogram of diet in order to establish the vitamin B_{12} requirement. Aureomycin, alone and in combination with vitamin B_{12}, was also tried

as a supplement to the basal diet. Twenty poults were usually used for each treatment.

The average four-week body weight was 430 g. with no supplement. The 20 microgram supplement of vitamin B_{12} produced an average weight of 472 g., which was the highest weight attained on vitamin B_{12} alone. Aureomycin alone produced average body weights of 519 g. in four weeks; this was increased to 533 g. with a supplement of vitamin B_{12} (10 micrograms) and was increased still more (551 g.) with the supplement of 20 micrograms of vitamin B_{12}. Aureomycin thus appeared to produce a considerably greater growth response than vitamin B_{12}.

Another group of poults of the same origin was fed a basal diet essentially similar to that described above except that it contained 10 per cent of fish meal and 3 micrograms of vitamin B_{12} per 100 g. They weighed an average of 452 g. in four weeks.

When this diet was supplemented with 25 mg. of aureomycin hydrochloride per kilogram of diet, the average four-week weight was 619 g. The same level of streptomycin sulfate produced body weights averaging 593 g., and the same level of terramycin hydrochloride produced average body weights of 644 g. Supplements of dried brewers' yeast or dried distillers' solubles with aureomycin were without effect.

In the second experiment the fish meal basal diet produced average body weights of 528 g. in four weeks. Penicillin G (K salt) at a level of 5 mg. per kilogram increased the four-week average weights to 650 g. A 25 mg. per kilogram supplement of the penicillin produced still better weights, an average of 712 g. Five mg. per kilogram of terramycin appeared to be as effective as 25, each producing body weights of approximately 600 g. Increasing the streptomycin supplement from 5 mg. per kilogram of diet, a noneffective level, to 10 mg. per kilogram of diet produced average weights of approximately 600 g., which were not improved by further additions of this antibiotic. Results approximately equal to those obtained with terramycin were obtained by supplementing the fish-meal basal diet with 50 mg. of 3-nitro-4-hydroxybenzene arsonic acid (628 g. weight at four weeks). Including all 4 antibiotics (terramycin, aureomycin, streptomycin, and penicillin) in the diet at a level of 25 mg. each per kilogram of diet was no better than penicillin alone.

In a third experiment additional studies were conducted to determine the influence of various combinations of antibiotics. Supplements of terramycin and penicillin alone were as effective as combinations of these or a combination of terramycin, penicillin, and streptomycin.

The authors concluded that of the antibiotics tested, penicillin was the most effective supplement since at a level of 5 mg. per kilogram of diet the antibiotic produced better growth than did higher levels of any of the other antibiotics.

Whether or not suboptimum levels of one antibiotic would be improved by suboptimum levels of another antibiotic is pertinent to the question of the relative effectiveness of various antibiotics as growth stimulants in animals.

These results, when compared with those reported for other species of animals, reveal some differences in response to antibiotics. T. J. Cunha and associates (*Arch. Biochem.* **30,** *269 (1951)*) noted that penicillin was of no benefit in stimulating growth in the pig, whereas streptomycin was partially effective but not so effeetive as aureomycin. These workers used a corn-peanut meal basal diet. A. R. Whitehill, J. J. Oleson, and B. L. Hutchings (*Proc. Soc. Exp. Biol. Med.* **74,** *11 (1950)*) had noted no difference between aureomycin, streptomycin, and penicillin as growth stimulants for pigs on corn-soybean meal basal diets. The basal diet was reported by these same investigators to influence responses to aureomycin and penicillin in chicks.

It thus appears that not only the animal species but also the basal diet employed can have an important bearing on the value of various antibiotics as growth stimulants.

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THE NUTRITION FOUNDATION

The Nutrition Foundation was organized by food and related manufacturers in December, 1941, as a sincere expression of their interest in scientific progress and human health. The basic purposes of the Foundation are: (1) the development of a comprehensive program of fundamental research, providing basic information in the science of nutrition; and (2) the support of educational measures that will assist in making the science of nutrition effective in the lives of present and future generations.

The publication of NUTRITION REVIEWS has been undertaken to enable professionally trained people to keep abreast of current progress and to have available an unbiased, authoritative review of the current research literature in the science of nutrition.

The Editorial Staff has been carefully selected so that the publication will merit, in reasonable degree, the confidence of the medical profession and others who work directly with the public in the field of nutrition. The service provided by the publication is distinct from that of an abstract journal, a review for laymen, or an extensive scientific review. Since the reviews as originally prepared by a member of the Editorial Staff are frequently modified by special referees and may be further modified by the Editorial Office in preparing final copy for the press, the Editorial Committee feels that it is preferable not to affix the names of Editorial Staff members to individual reviews. There is thus a high degree of group responsibility on the part of the Editor and Associate Editors.

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